

### **DETAILED ACTION**

1. The amendment to claims 1-2 and 8 along with the addition of claims 12-15 filed on February 14, 2008 have been acknowledged.

### ***Response to Arguments***

2. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection based on the amendment to claim 1. Applicant's amended the claims to include the limitation "interposed between" and further argued that the old rejection is not proper. The new limitation has been interpreted in light of the specification and a detailed discussion of the new rejection is located below. The previous rejection was proper before the amendment.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 4-5, 7, and 9-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Shen et al. (U.S. Patent 6,797,188, hereafter '188).

Claim 1: A method of cleaning a substrate processing apparatus [col. 1, lines 32-35 and 53-54; col. 2, lines 11-14] comprising: a processing container defined by an outer wall [(28), Fig. 1, col. 2, lines 66-67]; a holding stage [(32), Fig. 1, col. 5, lines 20-21 and 43] connected to a high-frequency power supply [(54), Fig. 1, col. 5, lines 45-47] [(54) is within (52 which is within (32); therefore it's connected] and provided in said processing container for holding a processing substrate [see Fig. 1]; an exhaust port for evacuating the inside of said processing container [(42), Fig. 1, col. 5, lines 27-30]; a microwave transmissive window [col. 5, lines 22-26; see Fig. 1 - the showerhead would be mounted to the top of the chamber and face down toward the substrate] provided on said processing container as part of said outer wall so as to face said processing substrate; a microwave antenna [(48), Fig. 1, col. 5, lines 33-39] provided on said microwave transmissive window [see above] and electrically connected to a microwave power supply [(46), Fig. 1, col. 5, lines 33-39]; a plasma gas/process gas supply portion [col. 5, lines 22-26] for supplying a plasma gas and process gas into said processing container where the process gas supply portion is provided between [col. 5, lines 22-26] said processing substrate on said holding stage [(32), Fig. 1] and said microwave transmissive window [see above] so as to face said processing substrate [refer to Fig. 1], said method comprising: a gas introducing step of introducing a cleaning gas into said processing container [col. 5, line 22]; a plasma exciting step of introducing a microwave into said processing container from said microwave antenna to thereby excite a plasma in said processing container [col. 5, lines 5-14 and 33-39]; and a bias applying step of applying a high-frequency power to said holding stage from said high-frequency power supply [col. 5, lines 5-14 and 45-47].

Claim 4: The method according to claim 1, wherein said cleaning gas contains oxygen [col. 4, line 67].

Claim 5: The method according to claim 1, wherein said cleaning gas contains hydrogen [col. 3, lines 49-53].

Claim 7: The method according to claim 1, wherein said cleaning gas contains a fluorine compound [col. 3, lines 14-22].

Claim 9: The method according claim 1, wherein said cleaning gas is introduced from said process gas supply portion [feeds from supply portion to showerhead and turns into plasma; refer to claim 1].

Claim 10: The method according to claim 1, wherein said cleaning gas is dissociated by said microwave plasma and a high-frequency plasma excited by said high-frequency power [col. 5, lines 22-26 and 33-47] so as to be reactive species, and a deposit deposited inside said processing container is etched by said reactive species so as to be removed [col. 2, lines 27-29; col. 3, lines 14-24].

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**7. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over '188 as applied to claim 1 above, and further in view of Ishii et al. (U.S. PGPub 2002/0050486, hereafter '486).**

Claim 2: '188 teaches the limitations of claim 1 above. It remains silent with respect to said process gas supply portion is made of a conductive material and grounded. However, '486 teaches that the process gas supply portion is made of a conductive material and grounded [page 5, paragraph 73]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the gas supply out of a conductive material and ground it to prevent electrostatic shock from forming and potentially harming personnel.

**8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over '188 as applied to claim 1 above, and further in view of Ishii et al. (U.S. PGPub 2001/0035130, hereafter '130).**

Claim 3: '188 teaches the limitations of claim 1 above. It remains silent with respect to wherein said microwave antenna is power-fed through a coaxial waveguide and comprises an

antenna body having an opening portion, a microwave radiating surface having a plurality of slots and provided on said antenna body so as to cover said opening portion, and a dielectric provided between said antenna body and said microwave radiating surface. However, '130 teaches a microwave antenna [sheet 1 - area between (50) and (62)] is power-fed through a coaxial waveguide [sheet 1 - (52)] and comprises an antenna body [sheet 1 - (54)] having an opening portion, a microwave radiating surface [sheet 1 - (60)] having a plurality of slots [sheet 1 - (62)] and provided on said antenna body so as to cover said opening portion, and a dielectric [sheet 1 - (66)] provided between said antenna body and said microwave radiating surface [page 3, paragraph 44]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the antenna system disclosed by '130 in the method of '188 with a reasonable expectation of success because '130 teaches that it is a suitable system to distribute a uniform plasma in the processing container to accomplish an even processing on a large-diameter wafer [abstract].

**9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over '188 as applied to claim 1 above, and further in view of Au et al. (U.S. PGPub 2001/0010228, hereafter '228).**

Claim 6: '188 teaches the limitations of claim 1 above. It remains silent with respect to the cleaning gas containing H<sub>2</sub>O. However, '228 teaches a cleaning gas containing H<sub>2</sub>O [page 1, paragraph 7]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use H<sub>2</sub>O cleaning gas as disclosed in '228 in the cleaning method of '188

with a reasonable expectation of success because '228 teaches that it is a suitable gas used to clean the walls within the chamber [page 1, paragraphs 1 and 7].

**10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over '188.**

Claim 8: '188 teaches the limitations of claim 1 above. '188 teaches that both the plasma gas and the process gas enter the chamber via the showerhead [col. 3; col. 5, lines 22-26], but it does not explicitly teach that the plasma gas supply portion is interposed between said microwave antenna and said process gas supply portion. It would have been obvious to one having ordinary skill in the art at the time the invention was made to supply the chamber with the gases via different entry points and not in the same apparatus (i.e. the showerhead), since it has been held that constructing a formerly integral structure in various elements involves only routine skill in the art and that rearranging parts of an invention involves only routine skill in the art. *Nerwin v. Erlichman*, 168 USPQ 177, 179. *In re Japikse*, 181 F.2d 1019, 86 USPQ70 (CCPA 1950).

**11. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over '188 as applied to claim 1 above, and further in view of Akahori et al. (U.S. PGPub 2002/0047203, hereafter '203).**

Claim 11: '188 teaches the limitations of claim 1 above. It remains silent with respect to the deposit containing a fluorine-added carbon film. However, '203 teaches a deposit containing a fluorine-added carbon film [page 2, paragraphs 39-40 and 44-45]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a fluorine-added

carbon film as disclosed in '203 in the method of '188 with a reasonable expectation of success because '203 teaches that it is a known material in semiconductor fabrication and that it is required to etch away the material [e.g. cleaning] when fabricating semiconductors.

**12. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over '188, and further in view of Loewenhardt et al. (U.S. Patent 6,581,612, hereinafter '612).**

Claim 12: '188 teaches the limitations of claim 1 above. '188 does not explicitly teach concurrently introducing a diluent gas into the processing chamber during the gas introducing step. However, '612 teaches in conventional practice a plasma process utilizes a diluent gas such as argon with the process gases [the diluent gas is connect to the same line as the process gases with valve control; therefore it is implicitly stated that it is supplied with the process gases] to improve plasma ignition and plasma stability [col. 2, lines 55-64; col. 4, lines 1-12]. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to supply a diluent gas with the process gases to improve plasma ignition and plasma stability.

**13. Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over '188 and '612 as applied to claim 12 above, and further in view of '228.**

Claim 13: '188 and '612 teach the limitations of claim 12 above. '612 teaches that diluent gas contains argon [col. 2, lines 61-64; col. 4, lines 11-12]. '188 and '612 remain silent with respect to the cleaning gas containing hydrogen and oxygen. However, '228 teaches a cleaning gas containing H<sub>2</sub>O [reads on hydrogen and oxygen; page 1, paragraph 7]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use

H<sub>2</sub>O cleaning gas as disclosed in '228 in the cleaning method of '188 with a reasonable expectation of success because '228 teaches that it is a suitable gas used to clean the walls within the chamber [page 1, paragraphs 1 and 7].

Claim 14: '188, '612, and '228 teach the limitations of claim 13 above. '612 also teaches in conventional practice a plasma process utilizes a diluent gas such as argon with the process gases [process gases reads on "cleaning gas"] [the diluent gas is connect to the same line as the process gases with valve control; therefore it is implicitly stated that it is supplied with the process gases] to improve plasma ignition and plasma stability [col. 2, lines 55-64; col. 4, lines 1-12].

**14. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over '188 as applied to claim 1 above, and further in view of Zhong et al. (U.S. Patent 6,124,927, hereinafter '927).**

Claim 15: '188 teaches the limitations of claim 1 above. It does not explicitly teach monitoring a change in light intensity within the chamber and stopping the application of the high-frequency power when the intensity of light changes by a predetermined amount. However, '927 teaches monitoring a change in the optical light emission and stopping the power when a drop of intensity is observed to prevent etching of the chamber wall [col. 4, lines 6-9 and 33-52]. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the end-point detection method taught by '927 in the method of cleaning disclose by '188 with a reasonable expectation of success because '927 teaches that such an end-point detection method will aid in preventing etching of the chamber wall which is to be avoided.



***Conclusion***

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole Blan whose telephone number is 571-270-1838. The examiner can normally be reached on Monday - Thursday 8-5 and alternating Fridays 8-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Art Unit: 1792

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/N. B./

Examiner, Art Unit 1792

/Alexander Markoff/

Primary Examiner, Art Unit 1792